

them right and left, the rays being composed of sharp radial lines, separated by furrows of markedly less brilliancy."

After there had been time to examine the photographic records of the eclipse in connection with the above description, the enormous difference between the photograph and the eye picture was fully recognised, and in my lecture at the Royal Institution on the eclipse, after referring to the actinic corona, to the striking similarity in the details of the photographs taken at different times and in different places, I said: "The solar nature of most, if not all, of the corona recorded on the plates is established by the fact that the plates, taken in different places, and both at the beginning and end of totality, closely resemble each other, and much of the exterior detailed structure is a continuation of that observed in the inner portion independently determined by the spectro-scope to belong to the sun."

Passing from the photographs to the drawings, I pointed out that in Mr. Holiday's sketch, for instance, we got an infinite number of dark radial lines extending down to the moon, with a greater extension than in the photographs, though in some places the shape of the actinic corona and some of its details were shown.

Thinking that this difference might be explained by different lights being superposed, so that of two superposed lights the naked eye used one, and the photographic plate the other, I asked the question whether the facts might not be reconciled, and really harmonised with what was actually seen in the telescope, even by supposing that the visual image, this glare let us call it, was sifted in the telescope by using greater or less magnification in the same way as it was separated out on the photographic plates and in our eyes by the different qualities of the light producing the visual and photographic images.

From this point of view, therefore, I regard Mr. Hasting's observation as one of very great interest, and I believe that it throws light upon a good many prior observations. I do not think, however, that any one will go with him when he proposes to abolish a true corona at the sun, for the reason that the observations to which I have drawn attention show that it is really a dual phenomenon as I pointed out in 1870, and although diffraction at the moon's edge may be the cause of one part, it cannot be the cause of the other. It is, perhaps, almost too early yet to speculate upon the changes in our views of the chemical nature of the external boundary of the sun's atmosphere which may be brought about by a complete discussion of the question which these observations again bring to the front. I long ago pointed out that the fact of getting in the spectro-scope an indication of a line at so many minutes of arc from the limb of the dark moon, was by no means a proof of the existence of a vapour or gas at that height above the sun. Maclear's observation in 1870 was of course the test, for the reason that if such a *caveat* were not available we must assume the existence of coronal matter between us and the dark moon. But in any case it is not too early to bear this in mind, that if in our spectroscopes we have been dealing with a true glare, from whatever cause produced, there will be an almost complete inversion necessitated, and in this way: the brilliancy of any particular wave-length of the glare may either depend upon the area of the surface at the sun producing light of that wave-length, or upon its inherent intensity. Now if we assume that only the inherent intensity is to be considered, then obviously the region of greatest temperature will cause the brightest light. The brightest light will therefore be produced in the lowest level of the solar atmosphere, but because of the glare it will appear to extend to the greatest distance from the sun. It may therefore have been that the line 1474, instead of indicating, as it has been supposed to do, that a substance

which gives a line at the part of the solar atmosphere most removed from the photosphere is really produced by that part of the atmosphere, was produced at that part of the atmosphere nearest the photosphere, and really at first sight—although this is by no means a matter on which one would wish to commit one's self hastily—it does seem as if this view would harmonise a great many facts which are very difficult of explanation in any other way.

I discovered the line 1474 in the chromosphere on June 6, 1869, and up to that time no bright line had been observed beyond those belonging to the spectra of hydrogen, sodium, and magnesium, with the exception of one line of barium, which was first seen in March, 1869. Now we know from the long-extended series of such observations for which we have to thank the industry of the Italian observers, that the line 1474 is now seen more persistently than any line which is not recorded in the spectra of hydrogen, magnesium, and sodium. The eclipse of last year taught us, if it taught us anything, that the lines which are thus persistent are the lines produced at the temperature of the hottest layers, and, if subsequent inquiry strengthens the view that the height to which the line 1474 appears to extend is really due to the depth at which the substance which produces it is restricted, the persistence of 1474 in ordinary chromospheric observations will be at once explained.

J. NORMAN LOCKYER

#### AGRICULTURE IN JAPAN<sup>1</sup>

DR. LIEBSCHER'S little work is the result, the author tells us, of his investigations during an eight months' sojourn in Japan in 1880. A cursory glance at the contents shows that it bears the physiognomy of a strictly scientific work. The work is divided into five parts:—(1) The condition of the climate and its influence upon the land-products; (2) the condition of soils and its influence upon the land-products; (3) the social condition before the year 1868 (before the reformation); (4) the reformation and reorganisation of the State since the year 1868; (5) foreign commerce. I shall notice shortly each chapter with some remarks. Beginning with the first chapter, Dr. Liebscher commences with the monsoon, within whose sphere Japan is situated. It has, as is well known, a certain determined direction during the whole year. The summer (south-west) monsoon comes from the south-west from April to September, while the winter (north-east) monsoon comes from the north-east during the rest of the year. To the first, according to Dr. Liebscher, Japan owes its tropical flora, such as *Chamerops excelsa*, *Thea viridis*, *Cycas revoluta*, &c., and to the same he attributes the chief land-products, such as cotton, sugar-cane, tobacco, Indian corn, and rice. Why the summer monsoon is so favourable to the growth of the land-products is because, says the author, it causes a warm temperature, and the abundant precipitation of rain (maximum 1794 mm. in a year). He ignores then altogether the geographical position of Japan, that on one side she lies partly in a sub-tropical and temperate zone, on the other she is surrounded on all sides by a large body of water. The north-east monsoon brings a dry and terribly cold winter, though somewhat modified by the "Kuro-Siwo" current and this monsoon is the sole factor that renders the climate unfavourable, causing the remarkable phenomenon of the "freezing of the soil." Dr. Liebscher says, the regular course of the monsoon assures the people who happen to inhabit those lands which lie within the sphere of that wind, of a never-failing good crop of rice. Thus we are accustomed to depend solely upon rice, and

<sup>1</sup> "Japan's landwirthschaftliche und allgemeinwirthschaftliche Verhältnisse nach eigenen Beobachtungen dargestellt." Von Dr. G. Liebscher. (Jena 1882.)

consequently we become vegetarians. We cannot entirely agree with him, but rather lay more stress upon the influence of the Buddhist religion, which once wielded sway over us. As to the unfavourableness of the climate due to the monsoon, he is unfortunate in selecting as an example the Hakone region. The volcano of Fuji San (3784 m.) is a high peak covered with everlasting snow, and at the foot of this lies the Hakone Pass (804 m.). Here Dr. Liebscher had seen on the western side (toward Fuji) around the Lake Hakone, a dreary sterile slope; while the opposite mountains, lying on the south, are covered with a luxuriant growth of forest. He ascribes the cause of the sterility of the northern to the cold winter monsoon, and the thickly wooded ranges to the summer monsoon. I explain this striking contrast quite in another way. Fuji San is an active volcano, and at the foot of this lies the region referred to. It is natural that no tree will flourish at or near recent volcanoes, which send out an enormous quantity of scoræ. Moreover the Hakone Pass is situated at a high altitude (804 m.). We find thick forest at the top of the Brocken in the Harz mountains. Could we expect the same at the summit of Vesuvius? The climate of Japan is not so ineffective as Dr. Liebscher has depicted in his work; in reality it is far more conducive to fertility than that of Germany.

The second chapter deals with the soil and its influence upon the agriculture. "A large tract of plain not far from Tokio is left uncultivated," says the author; "while the mountain slopes are turned into useful land. Such an irrational course is not difficult to understand when I consider the other deeds done by the Government and people." This is not so serious as it seems; he did not understand the irrigation of soils, which is of particular importance in the rice-producing countries. He mentions in another page that the total area of the empire is 38,243,640 hectares, of which the cultivated land occupies 4,508,482 hectares, *i.e.* 11.8 per cent.; while the area of Prussia is 34,823,420, with 17,435,605 hectares, *i.e.* 50.7 per cent. of the cultivated land. The balance is evidently against Japan. I must here remark that Prussia is not mountainous. The only notable range in the heart of Prussia is the Harz; the Thuringian forest, the Riesen and Sudeten mountains lie at the southernmost boundaries of that country; all the rest forms what is called the "North German Plain," levelled down uniformly by the Scandinavian glaciers in the Diluvial period. On the contrary, Japan is very mountainous. Moreover, it must be taken into account that we have newly taken possession of the Riü-Kiü Islands. The island Hokkaidô, Chi-Sima (the Kurile Islands) were neglected till thirteen years ago. They are now substantially incorporated into Japan, and the present Government is energetically striving to convert these into utility. From these circumstances the author is not justified in jumping to the conclusion as to the present state of things. We are glad to find that the yield per hectare in Japan is 35.62, while in Germany it is only 6.11 (Dr. E. Naumann). As to the geology, the bearing of which is of great importance to the soil and subsoil, Dr. Liebscher closely follows Rein's "Japan," without contributing his own observations. The chief rock-groups are: (1) the crystalline massive rocks (granite, diorite, diabase, porphyries); (2) the palæozoic schists; (3) the more recent volcanic rocks (trachyte, rhyolite, andesites, dolerite, basalt); (4) the alluvium and diluvium. Among the first group are phosphates, salts of potash and soda in the form of felspar, and apatite; and the same minerals are richly contained in the third group. In Rein's palæozoic schists, recent trias and cretaceous formations are ascertained by geologists of the Geological Survey, and must be separated from the second group of Rein's geological category. The author lays great stress upon the sterility of soils, to the extensive development of the

talc and chlorite schists and so-called "tuff soils"—a fine volcanic ejectamenta poured from the vent, and sediment under water. Indeed, I saw, myself, in the provinces of Musasi, Sanuki, and Rü, the phyllite system, in which the talc and chlorite schists form an essential member; still they sink into insignificance when compared with the other rock groups. Moreover, the so-called talc schist is in reality micaceous clay slate, and the pseudochlorite schist is chloritic epidote hornblende schist. These facts will somewhat modify the author's conclusion. As to the "tuff soil," he discusses and repudiates the uncertain analyses of Prof. E. Kinch and Herr von Korschelt. Neither of these gentlemen, I think, are correct, supposing that their analyses have been carefully prosecuted. They select as samples the "tuff soils" from the neighbourhood of Tokio. This city lies in the plain, surrounded by lofty volcanic chains—Fuji, Asama, Sirane, and many other ranges of volcanic nature, bounded on the south-east by sandstone mountains of the Awa province. Tuff and sandstones, *a priori*, could not produce fertile soils, and indeed "tuff soils" are the poorest in Japan. It is not found everywhere in that country, and appears exclusively confined to the neighbourhood of Tokio. I doubt very much the nature of the so-called "tuff soil." It may perhaps be an accumulation of diluvial sand and gravels. If samples for chemical analyses were obtained, the soils from the Mino province among others, we should be able to get a true insight into the Japanese soils. The author's conclusions, based upon these unfortunately ill-chosen samples, could, of course, not be correct, because the premises are already wrong. It is remarkable that Dr. Liebscher, as a professional agriculturist, after travelling through the greater part of Japan, should not be able to throw some new light on this point.

On the third chapter I have little to say, for the description relates to the bygone world prior to the year 1868. At present, our social condition assumes quite a new phase. Moreover the facts are compiled from the *Transactions of the Asiatic Society of Japan* and from the *Mittheilungen der deutschen Gesellschaft für Natur und Völkerkunde Ostasiens*. Most of the *Transactions* are translations from old obscure Japanese documents under the guise of new titles. One thing cannot however be passed unnoticed, that is the footnote on p. 72, which runs as follows:—"The Mikado may have, according to the Land Statute, 12 wives; the nobles, 8; the samurai, 2; the commons, 1." No such law ever existed in Japan. We are neither Mormons nor Mohammedans!

The fourth chapter deals with the political and social changes since the year 1868. It presents nothing new, except some odd remarks of a fanciful nature. The full accounts are already worked out by Le Gendre in "Progressive Japan," in Griffiths's "Mikado's Empire," and lastly in Rein's "Japan." On p. 105 it is stated that the Japanese Government lays a heavy tax upon the farmer which may amount to half what he has won by patient labour; this oppressive measure would hinder future agricultural progress. In reality the legitimate tax is only 2½ per cent. of the net product.

The last (fifth) chapter treats of the historical development of foreign commerce and the balance of exports and imports. It is seen from the elaborately compiled tables that Japan is now in a favourable condition. In spite of the author depreciating and underrating what the Japanese have done, and the apparently incurably unfavourable physical conditions of the country, the author has, in the concluding chapter, a somewhat reassuring statement. He says that Japan will gradually produce more and more agricultural products if the heavy tax is taken off and serviceable roads are constructed throughout the interior. If this should be the case, the buying power of the country will be increased, and Germany will have to look for an opportunity to engross the export commerce. I must remark, lastly, that the author seems to me not fair-



minded in doing a great injustice to the Government of Japan, by which he was temporarily employed.  
Munich B. KOTÔ

### NOTES

AT the annual general meeting of the Society of Arts, which was held on the 27th ult., Sir William Siemens being in the chair, the following resolution relative to the death of Mr. Spottiswoode, who was a vice-president of the Society, was passed:—"That this meeting of the Society of Arts desires to express the deep regret with which it has received the news of the death of Mr. William Spottiswoode, one of its vice-presidents, and its sense of the loss which the Society has sustained by his decease. In him England loses one of her most remarkable men of science, science itself one of its greatest ornaments, and all who knew him a sincere and valued friend. Besides devoting his own time and thought to the advancement of knowledge, he was ever ready to lend to all engaged in like pursuits the assistance of his experience and his wise counsel. In thus placing on record their own appreciation of his services, the Society desires to express its feelings of sympathy with his widow and his family, and also with the Fellows of the Royal Society, of which he was the honoured and beloved President."

THE report of the Council for the past year, which was then read, makes it abundantly evident that the useful work of the Society is being carried on as successfully as heretofore. The *convenzione* of the Society previously fixed for the 11th inst. has been postponed to the 25th. On that day it will be held at the Fisheries Exhibition, South Kensington, when the Prince and Princess of Wales will be present.

INTELLIGENCE has been received from Vivi, on the Congo, of the sudden death of the well-known Swedish explorer, Capt. T. G. Een. Mr. Een, who was on his way to join Mr. Stanley on the Upper Congo, fell down dead from heart disease, just as the signal for his caravan to start was given.

THE Vienna Academy of Sciences offers two prizes of 1000 florins each (about 84*l.*) for the best treatises (1) on the capacity of various crystals for conducting electrical currents; and (2) on the chemical constitution of albumen matter.

THE well known Russian merchant Sibiriakoff is about to send another vessel to the Siberian rivers this summer. This is the steamer *Obe*, built of Bessemer steel at Motala in Sweden, and which will leave Gothenburg this week. The vessel, which is provisioned for sixteen months, is commanded by the Russian Capt. Weide, who has for many years sailed on the Yenisei and Lena. She will proceed to Tromsø, where she will meet his other steamer, the *Nordenskjöld*. A schooner with building materials will accompany the steamers as far as Novaya Zemlya, where it is intended to erect some storehouses at Yugor Scharr for the reception of cargoes when ice prevents the approach to Obi or Yenisei. At Novaya Zemlya a member of the expedition, Capt. Grönbeck, with two Samoyedes, will be left behind to study the ice and make meteorological observations during the winter. The *Obe* and *Nordenskjöld* will proceed to Port Dickson and the River Yenisei, in the mouth of which, in the Sastorovsky, the *Nordenskjöld* discharges her cargo, viz. merchandise, and loads a cargo of Siberian produce, with which she returns to Europe. The *Obe* proceeds up river with what cargo she can carry as far as Yeniseisk, and remains there for river navigation during next summer.

M. THOLLON is now working in the Observatory at Paris. We are informed that the Pic du Midi Observatory is making great progress towards completion, and that Admiral Mouchez,

M. Thollon, and other astronomers will visit it towards the end of August.

THE monthly meeting of electricians has developed into a new institution, which is to be called Société des Électriciens. A committee has been established for determining the regulations to be proposed at a general meeting next October. M. Cochéry, Ministre des Postes et Telegraphes has been appointed honorary president of the society.

A REMARKABLE instance of the fidelity and sagacity of the dog happened on Friday last at Milford Haven, and is recorded in the daily papers. Two men named Davies and Taylor were out in a boat which was swamped. The former of these was the owner of a dog, and whilst the men were struggling in the water the animal caught hold of Taylor with the object of supporting him; finding, however, that it was not his master to whom he was rendering this assistance, he relinquished his grasp and went to the aid of Davies, his master, supporting him until he was rescued by a passing steamer, the other man being drowned.

ON June 13 at about 2 p.m. an earthquake was felt in the neighbourhood of Vossevangen in Norway. There was one continuous shock lasting several seconds, accompanied by a noise as that of a heavy train passing.

A NEW electric boat, exceeding in size all that have hitherto been designed, is now being fitted up at Millwall by the Electrical Power Storage Company, and is, we understand, nearly ready for her formal trial trip. The new craft is of iron, and measures forty-six feet in length. Her "engine" is a Siemens' dynamo of the D2 type, and works direct on the screw shaft without any gearing. The screw is of unusually narrow pitch, in order to enable the dynamo to run with a high velocity. She carries sixty-five accumulators of the Faure-Sellon-Volckmar pattern of the same size as those used in the smaller electric boat constructed last autumn by the same company. In the private trials made, a speed of eight miles per hour was maintained. This boat will be sent to Vienna, and will doubtless attract much notice at the forthcoming Electrical Exhibition in that city.

RIGNOLD's panorama of the Arctic regions will be exhibited at the Royal Victoria Coffee Hall during the present month. This panorama, which was painted by the late Clarkson Stanfield, R.A., has the reputation of being the finest marine painting extant.

UNDER the title of "Hardy Perennials and Old-fashioned Flowers" Mr. L. Upcott Gill of 170, Strand, has issued the first number of what will be, if carried out on the lines here laid down, a rather bulky book, and moreover an expensive one, inasmuch as the number before us, which bears date April, is priced at 6*s.*, contains only forty-eight pages, and proceeds only to CAL in an alphabetical arrangement of the names of the flowers which are recommended for cultivation. The aim of the work is a good one, namely, the bringing to notice many flowers for cultivation in our gardens that are now totally neglected or forgotten. Many old familiar friends are brought to mind in glancing through these forty-eight pages. The arrangement of the plants in alphabetical order of their scientific names is the best that could have been adopted. The wholesale use of capital letters for the specific names should be altered, and more care should be taken in the spelling, such mistakes occurring as *Achillea Aegyptica* for *ægyptiaca*, *Calthus* for *Caltha*, &c. Some of the figures also are extremely poor.

SINCE the above was written we have received the June number of this little work, which brings it down to *Helleborus* or the Christmas Rose. In this latest number the same lavish use of capitals occurs for the initial letter of the specific name